

## vertex.py

```
1 from utils import *
2 from matrix import Matrix, M, Ro_Any_Matrix
3
4 class Vertex:
5     def __init__(self, _x : float, _y : float, _z : float) -> None:
6         self.x : float = _x
7         self.y : float = _y
8         self.z : float = _z
9         self.V : tuple[float, float, float] = self.set_tuple()
10
11     def set_tuple(self) -> tuple[float, float, float]:
12         return (self.x, self.y, self.z)
13
14     def length(self) -> float:
15         return (self.x ** 2 + self.y ** 2 + self.z ** 2) ** (1 / 2)
16
17     def distance(self, _v) -> float:
18         return ((self.x - _v.x) ** 2 + (self.y - _v.y) ** 2 + (self.z - _v.z) ** 2) ** (1 / 2)
19
20     def draw(self) -> None:
21         glBegin(GL_POINTS)
22         glVertex3f(self.x, self.y, self.z)
23         glEnd()
24
25     def translate(self, _vector : list[float]) -> list[float]:
26         new_vertex : Matrix = M['T'](_vector) * Matrix([*self.V, 1], _is_vector=True)
27         self.x = new_vertex.V[0]
28         self.y = new_vertex.V[1]
29         self.z = new_vertex.V[2]
30         self.V = new_vertex.V
31
32     def rotate(self, _position, _angle : float, _axis : str) -> None:
33         new_vertex : Matrix = M[_axis](angle) * Matrix((self - _position).V,
34 _is_vector=True)
35         self.x = new_vertex.V[0] + _position.x
36         self.y = new_vertex.V[1] + _position.y
37         self.z = new_vertex.V[2] + _position.z
38         self.V = new_vertex.V
39
40     def rotate_any(self, _position, _yaw : float, _pitch : float, _roll : float) -> None:
41         new_vertex : Matrix = Ro_Any_Matrix(_yaw, _pitch, _roll) * Matrix((self -
42 _position).V, _is_vector=True)
43         self.x = new_vertex.V[0] + _position.x
44         self.y = new_vertex.V[1] + _position.y
45         self.z = new_vertex.V[2] + _position.z
46         self.V = new_vertex.V
47
48     def __sub__(self, _v):
49         return Vertex(self.x - _v.x, self.y - _v.y, self.z - _v.z)
50
51     def __mul__(self, _mul):
52         if isinstance(_mul, (int, float)):
53             return Vertex(self.x * _mul, self.y * _mul, self.z * _mul)
54
55     def __repr__(self) -> str:
56         return f'({self.x}, {self.y}, {self.z})'
```